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BEFORE THE BOARD OF OIL, GAS AND MINING
DEPARTMENT OF NATURAL RESOURCES
STATE OF UTAH

IN THE MATTER OF THE REQUEST FOR AGENCY ACTION OF LIVING RIVERS TO APPEAL THE DECISION BY THE DIVISION OF OIL, GAS AND MINING TO APPROVE THE APPLICATION OF EARTH ENERGY RESOURCES TO CONDUCT TAR SANDS MINING AND RECLAMATION OPERATIONS AT THE PR SPRINGS MINE	:	**NOTICE OF FILING OF TECHNICAL TESTIMONY OF ELLIOTT W. LIPS** **Docket No. 2010-027** **Cause No. M/047/0090 A**

Living Rivers, by and through its attorneys, hereby files the prepared direct testimony of Elliott W. Lips in the above matter.

Dated: January 7, 2011.

ROB DUBUC
JORO WALKER
Attorneys for Living Rivers

CERTIFICATE OF SERVICE

I hereby certify that on this 7th day of January, 2011, I served a true and correct copy of this prepared direct testimony of Elliott W. Lips to each of the following persons via email:

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IN THE MATTER OF THE REQUEST FOR AGENCY ACTION OF LIVING RIVERS TO APPEAL THE DECISION BY THE DIVISION OF OIL, GAS AND MINING TO APPROVE THE APPLICATION OF EARTH ENERGY RESOURCES TO CONDUCT TAR SANDS MINING AND RECLAMATION OPERATIONS AT THE PR SPRINGS MINE	:	Docket No. 2010-027 Cause No. M/047/0090 A

PREPARED DIRECT TESTIMONY

OF

ELLIOTT W. LIPS

ON BEHALF OF

LIVING RIVERS

January 7, 2011

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME?

A. My name is Elliott W. Lips

Q. BY WHOM ARE YOU EMPLOYED AND WHAT IS YOUR POSITION?

A. I am the principal engineering geologist of Great Basin Earth Science, Inc. located at 2241 East Bendemere Circle, in Salt Lake City, Utah.

Q. FOR WHOM ARE YOU TESTIFYING IN THIS PROCEEDING?

A. I am testifying on behalf of Living Rivers.

Q. WOULD YOU PLEASE SUMMARIZE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND?

A. I am a Professional Geologist licensed in the State of Utah.

In 1983, I received my Bachelor's degree from Western State College of Colorado with a double major in geology and physics. In 1990, I received my Master's Degree in geology from Colorado State University.

Between 1983 and 1985, I was employed by the U.S. Geological Survey. During this time I participated in, researched, and co-authored several studies relating to ground water movement and landslides, as well as surface water flooding. Most of the investigations were on sites of recent flooding and landslide activity in central Utah.

Between 1985 and 1997, I was employed as a full-time consulting engineering geologist. During this time I conducted approximately 15 investigations for ground water contamination from mines, mills, smelters, tailings ponds, and other industrial facilities in Utah, Colorado, Nevada, and California. I participated in four separate seep and spring surveys for existing and proposed mines in Utah and Nevada, ranging in size between 2 and 50 square miles. I performed hydrology and hydraulics analyses and designed runoff control plans at numerous mine and industrial facilities in Utah and Nevada. I prepared geology, hydrology, and engineering components of mining and reclamation plans for 21 open-pit and underground mines, mill and concentrator sites, smelters, and tailings impoundments.

Between 1996 and 2006 I was an Adjunct Associate Professor in the Department of Geography at the University of Utah. I taught classes in geomorphology (including surface and ground water systems), environmental studies, climate change, and resource conservation and environmental management.

In the past 25 years, I have assisted in the preparation of geology, hydrology, and engineering portions of mining and reclamation plans at six coal mine facilities in Utah (Knight Mine, Star Point Mine, Soldier Canyon Mine, Sunnyside Mines, Horse Canyon Mine, and the Rilda Canyon Mine). I have also supported permitting activities at five non-coal mine facilities in Utah (Mercur Mine, Kennecott [mine, mill, smelter, and tailings pond], Carr Fork Mine, IS&R [mill site and tailings pond], and the Goldstrike Mine). In addition to permitting activities for the Division of Oil Gas and Mining, I have prepared permit applications for ground- and surface-water discharge in compliance with the National Environmental Policy Act (NEPA) and the Clean Water Act.

In the past 13 years, I have provided permitting expertise in the areas of geology and surface and ground water quality and quantity for proposed mines, tailings ponds, dams,

highways, and river diversions. These projects have involved review of NEPA documents, 404 Permit Applications under the Clean Water Act, Federal Energy Regulatory Commission (FERC) Applications, and Utah Division of Oil, Gas and Mining and Reclamation Plans.

During my professional career, I have provided consulting services to federal, state, and local governmental agencies, private industry, and non-governmental organizations.

I have prepared reports and provided expert testimony twice in Federal Court and at several hearings before the Utah Board of Oil Gas and Mining.

Q. ARE YOU FAMILIAR WITH THE PERMITTING DOCUMENTS SUBMITTED BY EARTH ENERGY RESOURCES FOR THEIR PROPOSED PR SPRING MINE?

A. Yes. I have reviewed: 1) the Notice of Intention to Commence Large Mining Operations (NOI) submitted to the Utah Division of Oil, Gas and Mining (DOGM) (approved on September 19, 2009); 2) the Ground Water Discharge Permit-by-Rule Demonstration (GWDPRD) submitted to the Utah Division of Water Quality (DWQ) on February 21, 2008; 3) the letter dated March 4, 2008 from the DWQ on the ground water discharge permit-by-rule; and 4) the Storm Water Pollution Prevention Plan (SWPPP) prepared on March 25, 2009. In addition, I am familiar with the DOGM rules for Large Mining Operations (R647-4) and the DWQ General Multi-Sector Permit for Storm Water Discharges Associated with Industrial Activity (General Permit) and Appendices II.I and II.J.

Q. HAVE YOU INSPECTED THE SITE OF THE PROPOSED PR SPRING MINE?

A. Yes, I conducted a one-day reconnaissance of the proposed mine site and surrounding area on August 19, 2010.

II. PURPOSE AND SUMMARY OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. My testimony will provide evidence of deficiencies in Earth Energy Resources' (EER) NOI for the PR Spring Mine that was submitted to DOGM in May, 2009 (approved on September 19, 2009).

Q. WOULD YOU PLEASE SUMMARIZE YOUR TESTIMONY?

A. EER's NOI does not contain the information on projected impacts to surface and ground water systems that is required by the Rules for Large Mining Operations (R647-4.). Specifically, the Rules require the NOI to contain information on potential impacts and actions which are proposed to mitigate any of the impacts. Information on impacts and mitigation is either missing from EER's NOI, or is unsupported by data and analysis. In addition, the Rules require the NOI to contain a description of the proposed reclamation plan. EER's reclamation plan does not contain information sufficient to demonstrate that the reclaimed mine site will support the postmining land use or minimize future damage to the hydrologic system.

III. SURFACE WATER SYSTEMS

Q. CAN YOU BRIEFLY DESCRIBE THE SURFACE DISTURBANCE THAT WILL BE ASSOCIATED WITH THE PROPOSED MINE?

A. EER proposes to disturb a total of 213 acres within their lease boundary. This will consist of open pits (93 acres), waste rock and tailings dumps (70 acres), plant site and

processing facilities (15 acres), topsoil storage areas (18 acres), and roads (17 acres) (NOI, pg. 21-22).

Q. CAN YOU DESCRIBE THE CHANGES THAT WILL TAKE PLACE TO THE SURFACE WATER SYSTEM AS A RESULT OF THE PROPOSED MINE?

A. The changes to the surface water system will be a result of the changes in the configuration of the land surface. As described in the DOGM Practical Guide to Reclamation in Utah, "Disturbance of soil due to … mining activities will change the distribution, quality, and quantity of water runoff. These landform changes will subsequently affect the rate and pathways of water to stream channels." (pg. 78)

Q. WHAT TYPES OF IMPACTS ARE ASSOCIATED WITH THESE CHANGES IN THE SURFACE WATER SYSTEM?

A. Impact means to have an influence or direct effect on something (Cambridge and Merriam-Webster Dictionaries). With regard to surface water systems, the types of impacts, or effects, could be to the surface water quantity (runoff), surface water quality, or erosion.

Q. WHAT DO THE UTAH RULES FOR LARGE MINING OPERATIONS REQUIRE WITH REGARD TO SURFACE WATER SYSTEMS?

A. *Rule R647-4-109 Impact Assessment* requires that:

> *The operator shall provide a general narrative description identifying potential surface and/or subsurface impacts. This description will include, at a minimum:*

1. Projected impacts to surface and groundwater systems; .....

4. Projected impacts of the mining operations on slope stability erosion control, air quality, and public health and safety;

5. Actions which are proposed to mitigate any of the above referenced impacts.

IV. SURFACE WATER QUANTITY IMPACTS

Q. WHAT POTENTIAL IMPACTS COULD OCCUR TO SURFACE WATER QUANTITY AS A RESULT OF THE PROPOSED MINE?

A. As I discussed above, the mining operation will disturb a total of 213 acres. Runoff from the site will be eliminated from the pits, plant area, roads, and topsoil piles, which will be self-contained (NOI, pg. 36; SWPPP, pgs 15-16). In addition, the top surfaces of the overburden dumps will have a reverse gradient, eliminating surface water runoff from about half of the area (NOI, pgs 21-22; Figure 2a). Thus, the total area that presently contributes runoff to the natural drainages will be reduced by about 173 acres.

Q. HOW WILL THIS AFFECT THE SURFACE WATER QUANTITY?

A. There will be significantly less surface water flow in the intermittent and ephemeral drainages as a result of eliminating about 173 acres that currently contribute runoff.

Q. HOW LIKELY IS IT THAT THESE IMPACTS WILL OCCUR?

A. In my opinion, these impacts are almost certain to occur. I can not imagine a scenario where runoff is eliminated from 173 acres and there is no impact on the downstream surface water system.

Q. WHAT ARE THE IMPACTS TO THE DOWNSTREAM SURFACE WATER SYSTEM?

A. Surface runoff from the mine site currently drains to unnamed ephemeral or intermittent tributaries of Main Canyon. Any reduction of flow during snow melt and/or precipitation events will impact these streams by either resulting in less distance that the streams flow, or shorter periods of surface water flow. Either of these will result in a negative impact to wildlife that is dependent on these scarce water resources.

Q. TURNING TO IMPACTS FROM THE SURFACE RUNOFF THAT WILL OCCUR, ARE THE POTENTIAL IMPACTS AND ACTIONS WHICH ARE PROPOSED TO MITIGATE ANY OF THE PROJECTED IMPACTS TO SURFACE WATER QUANTITY EVALUATED IN THE NOI?

A. No. First, the NOI does not contain even a description of the potential impacts that will occur as a result of eliminating a significant area from contributing to runoff. Second, the NOI simply states that runoff from the outslopes of the overburden dumps will be controlled by facing the steepest portions of the slopes with coarse overburden material, armoring channels at the contact of the pile and native slope, and by installing a rip-rapped energy dissipater at the toe

(NOI, pg.37). Finally, there is no discussion in the NOI of potential impacts to the natural drainages as a result of altering the amount of runoff from the mine site.

Q. WHAT EFFECT WILL THE MITIGATION MEASURES HAVE ON THE QUANTITY OF SURFACE WATER?

A. Armoring of the slopes and placing rip rap and energy dissipaters will likely result in less runoff than if these measures were not used; however, without any data or analysis, it is not possible to say to what extent water quantity will be impacted.

Q. ARE THE POTENTIAL IMPACTS AND ACTIONS WHICH ARE PROPOSED TO MITIGATE ANY OF THE PROJECTED IMPACTS TO SURFACE WATER QUANTITY EVALUATED IN THE SWPPP?

A. No. The SWPPP simply states that the only water that could leave the site comes from the overburden storage sites, and that the use of armoring and rip-rap around the sides and base of the dumps will capture sediment, minimizing the volume of runoff and/or sediment that reaches waters of the state. However, "minimize" means to achieve the least quantity possible (Merriam-Webster Dictionary) and without data and analysis, this statement is unsupportable.

Q. IS THE NARRATIVE DESCRIPTION IN THE NOI OR SWPPP SUFFICIENT TO MEET THE REQUIREMENTS OF RULE R647-109?

A. No. Rule 647-109 requires identification of projected impacts and a description of the actions which are proposed to mitigate the impacts. In order to meet the requirements it is necessary to describe proposed mitigation. Mitigate means to make something less harmful

(Cambridge Dictionary). The intent of the rule is to describe the potential impacts and then to describe the actions that will make them less harmful. To satisfy the Rule, it is necessary to have a quantitative description of the projected impacts and a quantitative description of impacts after the proposed mitigative actions. The only way to demonstrate that the proposed actions lessen the projected impact is to have a quantitative analysis. For surface water quantity, the Rule thus requires a quantitative analysis of the existing runoff and the projected runoff in order to determine the potential impact, and then a quantitative analysis of the projected runoff with the proposed mitigative actions. As I discussed above, the NOI and SWPPP do not contain narrative descriptions of these analyses.

Q. CAN YOU DESCRIBE THE PROCEDURE THAT A PROFESSIONAL IN YOUR FIELD WOULD FOLLOW IN ORDER TO IDENTIFY AND EVALUATE PROJECTED IMPACTS TO SURFACE WATER QUANTITY?

A. It is a fairly straight forward and simple process to evaluate surface water runoff with rainfall-runoff models. The most commonly used procedure is the SCS Runoff Curve Number method (SCS, 1986) that predicts the runoff in a watershed based on rainfall and watershed conditions (area, soil, vegetation, slope, and geometry).

Q. HOW WOULD ONE USE RAINFALL-RUNOFF MODELS TO EVALUATE PROJECTED IMPACTS?

A. To evaluate the projected impacts, it is simply a matter of running the rainfall-runoff model under existing conditions and then changing the appropriate model inputs based on the changes that will occur in the watershed, and comparing the resulting runoff (either peak flow or

volume). In the case of the PR Springs mine, the impacts to surface water runoff would be quantified by changing the area that contributes runoff, and the soil, vegetation cover, and slope geometry of the overburden dumps.

Q. CAN THESE SAME RAINFALL-RUNOFF MODELS BE USED TO EVALUATE PROPOSED MITIGATION FOR THE IMPACTS?

A. Yes, it is a simple matter of changing the model inputs to reflect the proposed actions and comparing the quantity of runoff with and without the mitigation. By doing this you have the analysis necessary to evaluate whether any actions which are proposed to mitigate the projected impacts do in fact lessen the impact.

Q. DO THE NOI OR SWPPP CONTAIN A DISCUSSION OF RAINFALL-RUNOFF MODELS?

A. No.

Q. DO YOU HAVE EXPERIENCE USING THESE PROCEDURES AND MODELS FOR EVALUATING SURFACE RUNOFF?

A. Yes. I have used rainfall-runoff models on about 10-15 projects including complex disturbances associated with mining.

Q. DOES IT REQUIRE A LOT OF WORK TO SET UP AND RUN THESE MODELS UNDER VARYING CONDITIONS?

A. No. I would estimate that it would take only a few days of time for a qualified hydrologist or hydrogeologist to evaluate surface water runoff impacts from the PR Spring mine.

V. SURFACE WATER QUALITY IMPACTS

Q. CAN YOU DESCRIBE THE POTENTIAL CHANGES THAT WILL TAKE PLACE TO THE SURFACE WATER QUALITY AS A RESULT OF THE PROPOSED MINE?

A. EER proposes to construct two overburden/interburden storage areas (overburden dumps) in two ephemeral drainages above Main Canyon (NOI, pg. 20, Figure 2). These overburden dumps will contain 4.9 million cubic yards of overburden/interburden and sand tailings (NOI, pg. 14, 20, Figure 2a).

Q. WHAT WILL HAPPEN TO PRECIPITATION FALLING ON THESE DUMPS?

A. It depends on a lot of factors, but some of the precipitation will run off the surface and some of the precipitation will infiltrate into the dumps. The amount of infiltration depends on how fast the water is applied to the dump surface. If it is a slow snowmelt, or a low intensity rainfall event, most or all of the water will infiltrate. Only when there is a rapid snowmelt, or a high intensity rainfall event will the infiltration capacity of the soil be exceeded, resulting in surface water runoff.

Q. WHAT HAPPENS TO THE WATER THAT INFILTRATES INTO THE DUMPS?

A. Once the water infiltrates, it will not be lost to evaporation. Instead, the water will percolate through the overburden dumps and sand tailings. As it migrates downward, the water will incorporate residual chemicals from the processing of the tar sands and dissolved solids from these materials.

Q. WHAT HAPPENS ONCE THIS SEEPAGE REACHES THE BOTTOM OF THE DUMPS?

A. Once the seepage migrates through the dump it will either seep into the underlying natural ground or will flow along the preexisting topography of the ephemeral drainages and emerge at the toe of the dumps as surface water.

Q. WOULD YOU DISCUSS THE POTENTIAL IMPACTS TO THE SURFACE WATER QUALITY THAT COULD OCCUR?

A. I am only able to discuss the impacts conceptually because the data necessary to evaluate the potential impacts are not in the NOI. As discussed above, seepage from the overburden dumps may, over time, seep from the toe of the dumps and flow as surface water off the mine site. The quality of this water is determined by the chemistry of the sand tailings. Impacts to water quality are likely to result from chemicals remaining from the processing, or from high concentrations of total dissolved solids (TDS).

Q. ARE THE CHEMICALS REMAINING FROM THE PROCESSING A CONCERN FOR WATER QUALITY?

A. I am unable to given my opinion because the NOI does not contain a complete and accurate description of the chemicals being used in the process or the chemistry of the water that will leach through the tailings. Without this information, it is not possible to state what the potential impacts are.

Q. WHY IS TDS A CONCERN FOR WATER QUALITY?

A. TDS is a concern for three reasons. First, Willow Creek and its tributaries below Meadow Creek confluence – which includes Main Canyon – are listed on Utah's 303(d) List of Impaired Waters; the listed pollutant is TDS (Utah DEQ, 2006). Second, although Main Canyon is reported to be ephemeral or intermittent, there is a reservoir in Main Canyon approximately 3 miles down stream from the proposed PR Spring Mine. Third, high concentrations of TDS can negatively impact use of the water by down stream agricultural users and/or by wildlife.

Q. ARE THE POTENTIAL IMPACTS TO SURFACE WATER QUALITY EVALUATED IN THE NOI OR SWPPP?

A. No.

Q. ARE THE POTENTIAL IMPACTS TO SURFACE WATER QUALITY EVALUATED IN THE GROUND WATER DISCHARGE PERMIT-BY-RULE DEMONSTRATION?

A. No. The ground water discharge permit-by-rule demonstration (GWDPRD) does not discuss potential impacts to surface water from seepage of the tailings in the overburden dumps. In fact, the GWDPRD, which was prepared and submitted to the DWQ on February 21, 2008,

does not even mention that there will be tailings placed in the overburden dumps. Rather it reports that the tailings will be placed as backfill in the pit.

Q. DOES THE INFORMATION PROVIDED IN THE NOI, SWPPP, OR GROUND WATER DISCHARGE PERMIT-BY-RULE DEMONSTRATION MEET THE REQUIREMENT OF RULE R647-4-109?

A. No, because none of these documents includes a description of the potential impacts to surface water quality. Furthermore, there is not a description of the actions which are proposed to mitigate any of the potential impacts.

Q. CAN YOU DESCRIBE THE PROCEDURE THAT A PROFESSIONAL IN YOUR FIELD WOULD FOLLOW IN ORDER TO IDENTIFY AND EVALUATE PROJECTED IMPACTS TO SURFACE WATER QUALITY?

A. Again, it is a fairly straight forward and simple process to evaluate surface water quality impacts. The first step would be to collect and analyze samples to characterize existing water quality. Next, one would analyze the tailings and determine the water quality of the expected leachate. Finally, the volume of water that would be expected to leach through the overburden/tailings dump could be determined through modeling. At the end, one would know the amount of water and its water quality which could be compared to the existing water quality.

Q. ARE THERE ANY DATA OR MEASUREMENTS ON EXISTING SURFACE WATER QUALITY IN OR NEAR THE PROPOSED MINE SITE?

A. No. The NOI contains absolutely no data or measurements of existing surface water flows for any of the drainages in or near the proposed mine site. In fact the GWDPRD states "… Surface water quality data for nearby streams is lacking…." (pg. 4).

Q. WHAT WOULD HAVE BEEN INVOLVED IN COLLECTING DATA ON WATER QUALITY?

A. It simply involves collecting a sample of water in the streams when water is present and having the sample analyzed in a laboratory.

Q. ARE THERE ANALYSES OF TDS FOR THE LEACHATE OF THE TAILINGS?

A. EER reports that there are results from a non-standard analytical method and that these results are not considered relevant for estimation of the TDS of leachate from the process residuals. However, EER does not state why they believe that the results are not relevant, nor do they provide results which they believe are relevant. EER simply states that the expected TDS of the leachate that might develop from the processed oil sands is not known (GWPRD, pg. 11). This means that EER, DOGM, and the public have no way of evaluating whether or not the results are relevant or the impacts on surface water quality from this leachate.

Q. ARE THERE ANALYSES OF THE AMOUNT OF WATER THAT MAY LEACH THROUGH THE OVERBURDEN/TAILINGS DUMPS?

A. No. The permitting documents do not contain any analysis of the flow of water through the dumps. Without this analysis, it is not possible to estimate how much water will seep into the

underlying natural ground and how much will flow at the base of the dumps and ultimately discharge to surface water.

Q. HOW MUCH WORK WOULD HAVE BEEN REQUIRED TO COLLECT AND ANALYZE SURFACE WATER SAMPLES, ANALYZE THE LEACHATE, AND ANALYZE THE FLOW THROUGH THE DUMPS?

A. The collecting of the sample would require about a day per sample and it would be necessary to have several samples in order to characterize the existing surface water quality. Laboratory analyses are fairly inexpensive; all of the analyses could have been done for a few thousand dollars. The analysis of flow through the dumps would only have required a few days of time to set up and run a seepage model.

VI. EROSION IMPACTS

Q. EARLIER IN YOUR TESTIMONY YOU DESCRIBED EROSION AS AN IMPACT RELATED TO SURFACE WATER. WOULD YOU EXPLAIN THAT?

A. Surface water has the potential to erode and transport sediment. On slopes, the amount of erosion is controlled by the type of surface materials, the slope angle, and the vegetation. Surface disturbances associated with mining include the removal of vegetation and topsoil and alteration of the configuration of land surface. Thus, there is the potential for increased erosion of material, especially during high intensity rainfall events or times of rapid snowmelt.

Q. WHAT TYPES OF CHANGES WILL TAKE PLACE AS A RESULT OF THE PROPOSED MINING?

A. The mining will involve the disturbance of 213 acres. Vegetation and topsoil will be removed from 195 acres (topsoil, and presumably vegetation will not be removed from the 18-acre topsoil storage area). In addition, the configuration of the ground surface will change significantly as pits are excavated, as support facilities and roads are constructed, and as the dumps are constructed.

Q. WILL ALL OF THESE CHANGES TAKE PLACE AT ONE TIME?

A. No. There will be several types of changes occurring at different times, or phases. There will be changes associated with the initial site development and construction of the mine support facilities and roads. There will be additional changes associated with the mining operation as the pits are excavated, the dumps are constructed, and the land surface of much of the disturbed area becomes internally draining. Finally, there will be changes that take place as the pits are partially backfilled, the dumps are regraded and the site is reclaimed.

Q. IS IT POSSIBLE THAT THERE WILL BE IMPACTS ASSOCIATED WITH EROSION DURING EACH OF THESE PHASES?

A. Yes.

Q. DOES THE NOI DISCUSS EROSION CONTROL?

A. The NOI and SWPPP both describe erosion control in general, and provide several typical drawings for ditches and berms (NOI, Figures 2c-f). However, the NOI states that the

exact placement of these features will hinge on the final engineering plans or the nature of observed instances of runoff/sediment problems once the site is developed, or both. EER only commits to providing final engineering drawings to DOGM once they are available. Without knowing what specific erosion control features will be used, and where they will be placed, it is not possible to describe either the impacts from erosion or whether mitigation will be successful.

Q. DO THE NOI OR SWPPP DESCRIBE THE POTENTIAL IMPACTS FROM EROSION FOR ALL OF THE PHASES?

A. No. The NOI and SWPPP only discuss the erosion control for the mining operation, and the dumps when they are reclaimed. There is no discussion of the impacts from erosion or mitigation that are associated with the initial construction phase of the mine

Q. ARE THERE STANDARD METHODS FOR EVALUATING EROSION AND DEVELOPING AN EROSION CONTROL PLAN?

A. Yes, the DOGM reclamation guide states that "…When developing an erosion control plan, sufficient site-specific resource is required [sic]. Information on the following site characteristics should be collected and evaluated: acreage, soils, drainage pattern, rainfall, nearest receiving water, and groundwater information…." (pg. 80). The guide also describes how data on soil type, topography, climate, soil cover, and antecedent conditions are used in the Revised Universal Soil Loss Equation (RUSLE) to evaluate soil loss and must be considered when planning for the stabilization of disturbed sites (pg. 79).

Q. CAN THESE TYPES OF ANALYSES BE USED TO EVALUATE IMPACTS ASSOCIATED WITH EROSION AND TO ASSESS MITIGATION?

A. Yes, soil loss models, such as the RUSLE, can be used to evaluate present conditions. Then the model inputs can be changed to reflect the changes in the watershed that will occur as a result of the mining. The difference in the soil loss will be a measurement of the impact. Finally the model inputs can be changed to evaluate the actions that are designed to mitigate the impact due to erosion.

Q. DOES THE NOI CONTAIN THE RESULTS OF THE DATA ANALYSIS DESCRIBED IN THE DOGM GUIDE?

A. No. The NOI does not contain the results of either the existing conditions or the conditions with or without mitigation. As such, statements in the NOI that "[c]ontrolling runoff will minimize sediment production" (NOI, pg. 48), and "[t]he use of armoring and rip-rap around the sides and base of the dumps also capture sediment, minimizing the volume of runoff and/or sediments that reaches waters of the state" (SWPPP, pgs. 16-17), are unsupported by any data or analyses.

Q. WHY IS IT IMPORTANT TO CONTROL EROSION FROM THE MINE SITE?

A. Because erosion not only causes impacts at the mine site, but can impact downstream water resources as well. As stated in the DOGM reclamation guide, "[t]he impacts of drilling, pumping, and mining practices may not be confined to the land on which those activities occur. Neighboring landowners can be affected through increased soil erosion, sediment deposition,

water pollution, and flooding"(pg. 78). All of these are potential impacts to the portions of Main Canyon downstream of the proposed mine.

Q. WHAT WOULD HAVE BEEN INVOLVED IN EVALUATING THE POTENTIAL IMPACTS FROM EROSION?

A. It would have been a simple process of gathering data from on-site inspections and from published sources to use the RUSLE model. It would only have taken a few days of time to evaluate existing conditions, projected impacts, and mitigation.

Q. EARLIER IN YOUR TESTIMONY YOU DISCUSSED THE FACT THAT SOME OF THE PRECIPITATION FALLING ON THE DUMPS WILL RUN OFF AS SURFACE WATER. ARE THERE IMPACTS FROM EROSION ASSOCIATED WITH THIS RUNOFF?

A. Yes, if there is a rapid snowmelt or a high intensity rainfall event (as is common in the summer) there will be runoff from the surfaces of the dumps. During these times, there will be erosion from the dump faces.

Q. DOES THE NOI CONTAIN A DESCRIPTION OF THE IMPACTS ASSOCIATED WITH THIS EROSION AND THE MITIGATION FOR THE IMPACTS?

A. The NOI states that during mining, coarser materials typically end up near the toe of the expanding fills as the dumps sites are filled to their maximum capacity (pg. 49). The SWPPP states that this provides a natural energy dissipater for storm runoff from the faces of the dumps and catches fines between the coarse rock (pg. 16). While this may, or may not reduce the amount of sediment leaving the mine site, neither the NOI or SWPPP provide any data and

analysis in support of the potential impact from runoff or the effectiveness of this mitigation. Notably absent is an analysis of what happens during a large runoff event.

VII. GROUND WATER QUANTITY IMPACTS

Q. COULD YOU PLEASE BRIEFLY DESCRIBE THE GROUND WATER SYSTEM AT THE PR SPRING MINE?

A. I can describe what is presented by EER in the NOI, but it is an incomplete description. EER describes a regional aquifer with a potentiometric surface of 1,500 feet or greater below the ground surface in the general area of the mine (NOI, pg. 38). EER also describes "localized shallow groundwater likely representing isolated perched aquifers…" (NOI, pg. 30). Several seeps and springs are identified in the Main Canyon watershed, which supports perennial flow for some distance along its main stem (NOI, pg. 35).

Q. CAN YOU EXPLAIN WHY YOU BELIEVE THE DESCRIPTION OF THE GROUND WATER SYSTEM PROVIDED IN THE NOI IS INCOMPLETE?

A. First, it is based on drilling to a limited depth. EER drilled 25 holes at the site, but the maximum depth of the holes was 150 feet below the ground surface.

Q. WHY IS THIS NOT DEEP ENOUGH?

A. At a very minimum, EER should have drilled through all of the strata that they intend to mine under their current plan. None of the drill holes penetrated deeper than the "D" bed, the higher of the two beds of tar sands that EER proposes to mine. There is no information on the

presence, or absence, of water in the 15 foot thick layer between the "D" and "C" bed and the 24 foot thickness of the "C" bed itself (NOI, pg, 30).

Q. SHOULD EER HAVE EXTENDED THE DRILL HOLES DEEPER?

A. Although the current plans contemplate mining to a depth of approximately 145 feet, the maximum lease depth is 500 feet. If there is a change in the mine plan and EER decides to deepen the pits, there is no information on the presence or absence of ground water that could be impacted. In addition, because EER did not drill deeper than 150 feet, there is no supporting data that the regional aquifer is 1,500 below the ground surface at the PR Spring mine site, or that there is no aquifer at a shallower depth. The assumed depth of 1,500 feet comes from a regional report for the southern Uinta Basin in Utah and Colorado (Price and Miller, 1975).

Q. ARE THERE ANY OTHER AREAS IN WHICH THE DESCRIPTION OF THE GROUND WATER SYSTEM PROVIDED IN THE NOI IS INCOMPLETE?

A. EER only described "likely perched aquifers," but provides no information on the depth, thickness, number, or areal extent of these aquifers. This information is particularly important because these aquifers are likely to be the first and most impacted aquifers as a result of the mining operation.

Q. IS THERE ANY THING ELSE LACKING IN THE DESCRIPTION OF THE GROUND WATER SYSTEM?

A. According to the record, EER did not undertake a seep and spring survey to identify all locations of ground water discharge in the area. This is a serious lack of information on the presence of ground water.

Q. IS THERE ANY THING ELSE LACKING IN THE DESCRIPTION OF THE GROUND WATER SYSTEM?

A. EER provides no maps or cross-sections showing the relationship of the location and elevation of the seeps and springs to the perched aquifers identified in the drilling program. Maps and cross-sections are necessary to describe the existing ground water system in order to understand the potential impacts from the proposed mining operation.

Q. BASED ON THE INFORMATION PRESENTED IN THE NOI AND OTHER PERMIT DOCUMENTS, IS IT LIKELY THAT THERE ARE GROUND WATER SYSTEMS IN THE MINE PERMIT AREA?

A. Yes, the GWDPRD reports that mining will occur down to and including the "C" tar sand bed which is located in the Douglas Creek Member of the Green River Formation. The Douglas Creek Member forms the uppermost recognized aquifer in the project area (pg. 2).

Q. ARE THERE OTHER PUBLISHED REPORTS OF AN AQUIFER IN THE DOUGLAS CREEK MEMBER?

A. The GWDPRD also cites the BLM reporting that "[t]he Douglas Creek Aquifer receives recharge mainly by infiltration of precipitation and surface water in its outcrop area, with little

leakage from underlying bedrock aquifers. It discharges locally to springs in the outcrop area and to alluvium along major drainageways such as the Green and White Rivers…." (pg. 2).

Q. IS THERE OTHER EVIDENCE OF AQUIFERS IN THE DOUGLAS CREEK MEMBER?

A. Yes, aquifers in this geologic unit are confirmed by the presence of numerous seeps and springs in the Meadow Canyon sub-watershed, the Trail Canyon sub-watershed, and the Main Canyon watershed, all of which are shown to be in the Douglas Creek Member of the Green River Formation (NOI, Figures 5 and 7).

Q. WHAT DOES THE PRESENCE OF THESE AQUIFERS TELL YOU ABOUT THE RECHARGE IN THE AREA?

A. The presence of these aquifers also provides evidence that in this area, precipitation exceeds evapotranspiration and runoff, and that seepage into the ground does occur.

Q. CAN YOU DISCUSS THE POTENTIAL IMPACTS TO THE GROUND WATER QUANTITY THAT WILL OCCUR AS A RESULT OF THE PROPOSED MINING?

A. EER proposes to excavate 7,888,941 cubic yards of overburden and tar sands from two pits totaling 93 acres (NOI, pgs. 22, 24). The maximum depth of the North Pit will be approximately 140 feet; the floor of the West Pit will be at an elevation of approximately 7,860 feet (NOI, pgs. 46-47). The excavation and removal of this material will likely impact the ground water quantity in the perched aquifers that currently discharge at the numerous seeps and springs in the vicinity of the proposed mine.

Q. WHY DO YOU BELIEVE THAT THERE WILL BE IMPACTS TO THESE AQUIFERS?

A. In the Main Canyon watershed there are at least four seeps located directly adjacent to the affected area at elevations between 7,480 and 8,020 feet (NOI, Figure 7). Excavation of the material from the pits (almost certainly located upgradient from the seeps and springs) will likely dewater the localized perched aquifers and disrupt flow to the springs.

Q. HOW LONG WILL THESE IMPACTS EXIST?

A. This impact to ground water quantity will likely occur during the time the mining operation is on going and the pits are being dewatered by EER. The interruption of flow may extend indefinitely, because even though the backfilled pits will collect water, the water may seep from the bottom of the pit or flow over the lip of the pit, and not follow the pre-mining pathways to the present seeps and springs.

Q. IS IT POSSIBLE THAT AQUIFERS BELOW THE PITS WILL ALSO BE IMPACTED?

A. Yes, impacts are likely to occur to any aquifers located below the elevation of the pits because recharge to them will be eliminated during the mining operation, and possibly after the pits are backfilled. Unfortunately, EER did not drill deep enough to fully identify or evaluate this projected impact.

Q. WHY ARE THESE AQUIFERS IMPORTANT?

A. As I discussed above, there are several seeps and springs in the vicinity of the mine area that are likely discharging from these aquifers. These seeps and springs are a source of water for wildlife.

Q. ARE THE PROJECTED IMPACTS TO THE GROUND WATER QUANTITY IN THE ISOLATED PERCHED AQUIFERS DISCUSSED IN THE NOI?

A. No.

Q. ARE THE PROJECTED IMPACTS TO THE GROUND WATER QUANTITY IN THE AQUIFERS BELOW THE MINED AREA DISCUSSED IN THE NOI?

A. No. As I discussed above, EER did not even drill to the lowest of the tar sand beds to be mined, so no information exists on the presence or absence of an aquifer between the two tar sand beds to be mined, or any aquifer immediately below the mine area.

Q. CAN YOU DESCRIBE THE PROCEDURE THAT A PROFESSIONAL IN YOUR FIELD WOULD FOLLOW IN ORDER TO IDENTIFY AND EVALUATE PROJECTED IMPACTS TO GROUND WATER QUANTITY?

A. The first step would be to identify and quantify the existing ground water systems. This would involve drilling and the collection of data on the stratigraphy (geologic units) and the occurrence of water. The drill holes would need to extend to a depth of projected impacts below the mine area.

Q. HOW DEEP SHOULD THE DRILL HOLES EXTEND?

A. It depends on the site specific geologic conditions and the mining plan. If there are thick layers of rocks with high permeability immediately below the layer of tar sands to be mined (potential aquifers), the drilling should be deep enough to confirm the presence or absence of an aquifer that could be impacted.

Q. WHAT ELSE WOULD A PROFESSIONAL IN YOUR FIELD DO IN ORDER TO IDENTIFY AND EVALUATE PROJECTED IMPACTS TO GROUND WATER QUANTITY?

A. It would be necessary to collect data on current discharges from existing points of ground water discharge from surveys of seeps and springs conducted at varying times of the year. Next, one would prepare maps and cross-sections showing the areal extent and gradients of piezometric surfaces of all aquifers.

Q. HOW WOULD THESE DATA BE USED TO EVALUATE PROJECTED IMPACTS?

A. Based on these data, it would be possible to evaluate the projected impact to existing ground water quantity with the use of simple flow models or equations governing flow of ground water.

Q. DO THE NOI OR OTHER PERMIT DOCUMENTS CONTAIN ANY DATA OR MEASUREMENTS ON DISCHARGES FROM THE SEEPS AND SPRINGS IN OR NEAR THE PROPOSED MINE SITE?

A. No.

Q. DO THE NOI OR OTHER PERMIT DOCUMENTS CONTAIN MAPS OR CROSS-SECTIONS OF AQUIFERS IN OR NEAR THE PROPOSED MINE?

A. No.

Q. DO THE NOI OR OTHER PERMIT DOCUMENTS CONTAIN ANY EVALUATION OF QUANTITY OF RATE OF FLOW IN ANY OF THE AQUIFERS AND TO ANY OF THE SEEPS AND SPRINGS?

A. No.

Q. DOES THE NOI CONTAIN A GENERAL NARATIVE DESCRIPTION OF THE ACTIONS WHICH ARE PROPOSED TO MITIGATE ANY OF THE PROJECTED IMPACTS TO GROUND WATER QUANTITY?

A. No.

VIII. GROUND WATER QUALITY IMPACTS

Q. CAN YOU DISCUSS THE POTENTIAL IMPACTS TO THE GROUND WATER QUALITY AS A RESULT OF THE PROPOSED MINE?

A. The potential impacts to the ground water quality are from the leaching of precipitation through the tailings placed in the backfilled pits and in the overburden dumps. Even though some water is lost to runoff and evaporation, over time, precipitation will percolate through the overburden dumps and tailings and will incorporate residual chemicals from the processing and dissolved solids from these materials.

Q. IS IT POSSIBLE TO DETERMINE THE AMOUNT OF WATER THAT WILL SEEP INTO THE GROUND WATER SYSTEM FROM THE DUMPS?

A. Yes, as I discussed above, once the seepage migrates through the dumps, it may seep into the ground impacting underlying aquifers or it may flow along the preexisting topography and flow out at the toe of the dumps. Seepage modeling can evaluate the geometry of the contact, the material permeabilities, and hydraulic conditions to estimate the amount of water that will seep into the underlying ground.

Q. IS IT POSSIBLE THAT SEEPAGE WILL OCCUR THROUGH THE BACKFILLED PITS?

A. Yes, even though the pits will be backfilled and will not impound surface water after reclamation, over time, precipitation will percolate through the tailings in the backfilled pits and will incorporate residual chemicals and dissolved solids from these materials. Once the material becomes saturated and head builds up, seepage will occur into either adjacent or underlying aquifers, or flow will occur over the lip of the backfilled pit. Modeling of the flow can determine which of these is likely to occur.

Q. WHAT IS THE IMPACT TO THE GROUND WATER QUALITY FROM THIS SEEPAGE?

A. The impact from seepage through the tailings into the ground water system is two-fold. First, the aquifers themselves will be impacted by the water quality of the tailings seepage. Second, where the impacted aquifers discharge to the surface as seeps and/or springs, the surface

water flow will be impacted by chemicals remaining from the processing and from TDS. These seeps and springs are a source of water for wildlife.

Q. WHY ARE CHEMICALS REMAINING FROM THE PROCESSING A CONCERN FOR WATER QUALITY?

A. I can not provide an opinion on the potential impacts of these chemicals on water quality because the NOI does not contain a complete and accurate description of the chemicals being used in the process or of the chemistry of the water that will leach through the tailings. Without this information, it is not possible to state what the potential impacts are.

Q. WHY IS TDS A CONCERN FOR WATER QUALITY?

TDS is a concern for three reasons. First, Willow Creek and its tributaries below Meadow Creek confluence – which includes Main Canyon – are listed on Utah's 303(d) List of Impaired Waters; the listed pollutant is TDS (Utah DEQ, 2006). Second, although Main Canyon is reported to be ephemeral or intermittent, there is a reservoir in Main Canyon approximately 3 miles down stream from the proposed PR Spring Mine. Third, high concentrations of TDS can negatively impact use of the water by down stream agricultural users and/or by wildlife as the ground water discharges to seeps and springs and flows down channels.

Q. ARE THE POTENTIAL IMPACTS TO GROUND WATER QUALITY EVALUATED IN THE NOI?

A. No.

Q. ARE THE POTENTIAL IMPACTS TO GROUND WATER QUALITY FROM THE DUMPS EVALUATED IN THE GROUND WATER DISCHARGE PERMIT-BY-RULE DEMONSTRATION?

A. No. The ground water discharge permit-by-rule demonstration (GWDPRD) does not discuss potential impacts to ground water from seepage of the tailings in the overburden dumps. In fact, the GWDPRD, which was prepared and submitted to the DWQ on February 21, 2008, does not even mention that there will be tailings placed in the overburden dumps. Rather, it only reports that the tailings will be placed as backfill in the pit (pgs. 5,8).

Q. DOES THE GROUND WATER DISCHARGE PERMIT-BY-RULE DEMONSTRATION DISCUSS THE POTENTIAL FOR SEEPAGE OF CONTAMINATED WATER FROM THE BACKFILLED PITS?

A. The GWDPRD reports "[t]he processed sand will be dry (10-20 percent moisture content), and because of the low rainfall in the area, breakthrough of infiltrating precipitation to the base of the pit waste deposits is not anticipated to occur…." (pg. 12).

Q. IN YOUR OPINION, IS THIS STATEMENT CORRECT?

A. No. First, sand containing 10-20 percent moisture is not dry. Second, EER does not report whether the moisture content is based on the ratios of volume or mass. These are not equal, and the differences are significant. Assuming that the reported moisture is based on mass, sand with 10-20 percent moisture content would be at or near field capacity. This is the moisture content where all the water that can drain by gravity has drained from the sand. If the sand is at field capacity, any additional water from precipitation will result in seepage. However, if the

moisture content is based on volume, the sand would be saturated and seepage will occur even without the addition of additional water from precipitation.

Q. IS THERE ANY THING ELSE ABOUT THIS STATEMENT YOU THINK IS NOT CORRECT?

A. Yes. The statement that breakthrough is not anticipated to occur is unsupported by any data or analyses and is flatly incorrect. Seepage through the backfilled pits WILL be sufficient to reach the base of the pit. The assumption that precipitation in the area is too low for this to occur completely ignores the fact that precipitation is sufficient to recharge shallow perched aquifers that contribute flow to the numerous seeps and springs in the area. As discussed above, this is a clear demonstration that infiltration of precipitation does occur, and that over time, this infiltration recharges aquifers. There is no basis to assume that infiltration will not similarly occur in the backfilled pits. The uncertainty over whether the moisture content is calculated based on mass or volume simply affects how quickly seepage will occur.

Q. WHAT DOES THE GROUND WATER DISCHARGE PERMIT-BY-RULE DEMONSTRATION SAY WITH REGARD TO TDS?

A. EER claims to have investigated the chemical characteristics and leaching potential of the processed tar sands. According to EER, the results of this analysis show that the processed sand and processed fines will have total dissolved solids (TDS) concentrations of 300 and 6,100 mg/kg as opposed to the unprocessed tar sand with concentrations of 24 mg/kg.

Q. HOW DO YOU INTERPRET THESE RESULTS WITH REGARD TO IMPACTS TO GROUND WATER QUALTIY?

A. Taken as reported by EER, this would indicate that the leachate would have TDS concentrations of approximately 12 - 254 times the TDS concentration of the unprocessed tar sand.

Q. DO YOU FIND THESE RESULTS SUFFICIENT TO EVALUATE THE PROJECTED IMPACTS TO GROUND WATER QUALITY?

A. No, because EER states that these results are "from a non-standard analytical method; therefore these results are not considered relevant for estimation of the TDS of leachate from the process residuals. The expected TDS of the leachate that might develop from the processed oil sands is not known …." (GWDPRD, pg. 11). However, as I discussed above, EER does not provide an explanation as to why they believe the results are not relevant, and they do not provide any other results which they believe are relevant. It is possible that the results presented by EER are representative of the TDS of the leachate.

Q. DOES THE INFORMATION PROVIDED IN THE NOI OR GROUND WATER DISCHARGE PERMIT-BY-RULE DEMONSTRATION MEET THE REQUIREMENT OF RULE R647-4-109.1?

A. No, because there is no description of the existing ground water quality, no description of the water quality of the leachate that will be generated from seepage through the tailings, and no description of the movement of this contaminated ground water into the environment.

Q. CAN YOU DESCRIBE THE PROCEDURE THAT A PROFESSIONAL IN YOUR FIELD WOULD FOLLOW IN ORDER TO IDENTIFY AND EVALUATE PROJECTED IMPACTS TO GROUND WATER QUALITY?

A. The first step would be to collect and analyze samples to characterize the existing water quality from the perched aquifers and from seeps and springs. Next, one would analyze the tailings and determine the water quality of the expected leachate. Finally, the volume of water that would be expected to leach through the overburden/tailings dump and through the backfilled pits could be determined through modeling. At the end, one would know the amount of water and its water quality which could be compared to the existing ground water quality.

Q. ARE THERE ANY DATA OR MEASUREMENTS ON EXISTING GROUND WATER QUALITY IN OR NEAR THE PROPOSED MINE SITE?

A. No. The NOI contains absolutely no data or measurements of existing ground water quality in or near the proposed mine site. In fact the GWDPRD states "[t]he baseline water quality of ground water underlying the project area is not known…." (pg. 4).

Q. ARE THERE ANALYSES OF TDS FOR THE LEACHATE OF THE TAILINGS?

A. As I discussed above, EER reports the results of leaching analysis which show that the processed sand and processed fines will have significantly higher TDS concentrations than the unprocessed tar sands. However, EER dismisses these results without conducting further analyses and simply states that the expected TDS of the leachate that might develop from the processed oil sands is not known.

Q. DOES THE NOI CONTAIN A GENERAL NARRATIVE DESCRIPTION OF THE ACTIONS WHICH ARE PROPOSED TO MITIGATE ANY OF THE PROJECTED IMPACTS TO GROUND WATER QUALITY?

A. No.

Q. DOES THE GROUND WATER DISCHARGE PERMIT-BY-RULE DEMONSTRATION CONTAIN INFORMATION SUFFICIENT TO SATISFY THE DIVISION'S RULES FOR LARGE MINING OPERATIONS?

A. No, the GWDPRD submitted to the DWQ on February 21, 2008 contains an inaccurate description of the proposed mining operation than what is being proposed in the NOI and therefore underestimates impacts to ground water quality. The mining operation proposed in the NOI will have more adverse impacts on ground water quality that the operation assessed in the GWDPRD.

Q. CAN YOU EXPLAIN WHY THE DESCRIPTION IS INACCURATE AND WHY IT UNDERESTIMATES GROUND WATER QUALITY IMPACTS?

A. As I discussed above, the GWDPRD states that the tailings will be placed in the backfilled pits (pgs. 5, 6), whereas the NOI reports that tailings will also be place in the dumps (NOI, pg. 20, 21, Figure 2a). This is a significant difference because the GWDPRD did not even consider the dumps (and the tailings incorporated in them) as a potential source of ground water contamination.

Q. ARE THERE DIFFERENCES WITH REGARD TO THE SIZE OF THE PITS?

A. Yes, the GWDPRD only mentions mining from a single 62-acre pit (pg. 4), whereas the NOI reports mining from two pits totaling 93 acres (pg. 22). This is significant because the pits described in the mining plan in the NOI are 50 percent larger than the one described in the GWDPRD.

Q. ARE THERE DIFFERENCES WITH REGARD TO THE SIZE OF THE DUMPS?

A. Yes, the GWDPRD reports two overburden/interburden disposal sites (approximately 25 acres each); whereas the NOI reports that they will be 36 and 34 acres in size (pg. 22). This is significant because the dumps described in the mining plan in the NOI are 40 percent larger than the ones described in the GWDPRD.

Q. ARE THERE PROBLEMS WITH THE DETERMINATION REACHED BY THE DWQ?

A. Yes, the *de minimus* potential effect on ground water quality and aquifers determination by the DWQ (letter dated March 4, 2008) is based on factors contrary to those presented in the GWDPRD. Specifically, the DWQ based their determination, in part, on the statement that "[t]here are no springs in the Earth Energy leased area and the nearest spring is PR Spring located slightly less than a mile east of the project site…" (DWQ letter, pg. 2). However, as clearly shown on Figure 7 of the NOI (submitted with the GWDPRD), there are 9 water right filings for seeps or springs and 4 seeps that were identified in the field, all within EER's lease boundary.

Q. IS THE DETERMINATION REACHED BY THE DWQ VALID?

A. No, the determination reached by DWQ is flawed due to a lack of data and analysis. It is impossible to support a *de minimus* determination without any data on existing water quality (the fundamental basis for determining impacts), an accurate characterization of water quality of the seepage through the tailings in the pit and dumps, and a complete and accurate analysis of the flow of water through the waste dumps and pits into underlying and/or adjacent aquifers. None of these data and analyses are in the GWDPRD.

IX. RECLAMATION

Q. DOES THE NOI STATE THE OBJECTIVE OF THE RECLAMATION?

A. Yes, the NOI says that the overall objective of the reclamation plan is to reclaim the entire affected area so as to allow postmining land uses of wildlife habitat and open space to resume (pg. 52).

Q. DOES THE NOI DISCUSS THE INTENT OF THE RECLAMATION PLAN?

A. Yes, the NOI states that the intent is to meet the requirements of the Utah Rules at R647-4 and to meet the objectives of 40-8-12 of the Utah Mined Land Reclamation Act (pgs. 52-53).

Q. ARE YOU FAMILIAR WITH 40-8-12 OF THE UTAH MINED LAND RECLAMATION ACT?

A. Yes, 40-8-12 discusses the objectives of mined land reclamation:

40-8-12. Objectives.

The objectives of mined land reclamation are:

(1) to return the land, concurrently with mining or within a reasonable amount of time thereafter, to a stable ecological condition compatible with past, present, and probable future local land uses;

(2) to minimize or prevent present and future on-site or off-site environmental degradation caused by mining operations to the ecologic and hydrologic regimes and to meet other pertinent state and federal regulations regarding air and water quality standards and health and safety criteria; and

(3) to minimize or prevent future hazards to public safety and welfare.

Q. DOES THE NOI SAY ANYTHING ELSE WITH REGARD TO CONDUCTING RECLAMATION?

A. Yes, the NOI states "In order to ensure an environmentally safe and stable condition for the wildlife in the area that meets the objectives of the Utah Mined Land Reclamation Act 40-8-12, Earth Energy will leave safe, stable topography; establish native vegetation suitable for habitat; remove man-made structures, including tanks, ponds, etc.; and cause no degradation or harm to water resources…." (pg. 52). In addition, the NOI states that "Earth Energy would conduct reclamation as required under the Utah Rules R647-4…" (pg. 61).

Q. DO THE UTAH RULES R647-4 SPECIFY REQUIREMENTS FOR RECLAMATION PRACTICES?

A. Yes, R647-4-111 contains several specific requirements for reclamation practices.

Q. ARE ANY OF THESE RULES RELEVENT TO SURFACE AND GROUND WATER SYSTEMS AND EROSION?

A. Yes, the following are relevant to surface and ground water systems and erosion:

R647-4-111.2. Drainages - If natural channels have been affected by mining operations, then reclamation must be performed such that the channels will be left in a stable condition with respect to actual and reasonably expected water flow so as to avoid or minimize future damage to the hydrologic system.

R647-4-111.3. Erosion Control - Reclamation shall be conducted in a manner such that sediment from disturbed areas is adequately controlled. The degree of erosion control shall be appropriate for the site-specific and regional conditions of topography, soil, drainage, water quality or other characteristics.

R647-4-111.4. Deleterious Materials - All deleterious or potentially deleterious material shall be safely removed from the site or left in an isolated or neutralized condition such that adverse environmental effects are eliminated or controlled.

R647-4-111.5. Land Use - The operator shall leave the on-site area in a condition which is capable of supporting the postmining land use.

R647-4-111.6. Slopes - Waste piles, spoil piles and fills shall be regraded to a stable configuration and shall be sloped to minimize safety hazards and erosion while providing for successful revegetation.

Q. DOES THE NOI CONTAIN A DESCRIPTION OF THE RECLAMATION PRACTICES SPECIFIED IN R647-4-111?

A. No.

Q. DO YOU KNOW WHY NOT?

A. Because according to R647-4-103, they are not required to be in the NOI.

Q. IF THE NOI DOES NOT CONTAIN A RECLAMATION PLAN THAT DESCRIBES THE RECLAMATION PRACTICES, HOW WILL DOGM KNOW THAT EER WILL COMPLY WITH THE RULES SPECIFIED IN R647-4-111?

A. The NOI states that DOGM will make "visual inspections" at the site throughout reclamation. These inspections "will focus on erosion and sediment control, further ensuring that reclamation goals can be met. Further, visual inspections will also be made by DOGM, and will include ensuring that all reclamation activity obligations under the Utah Mined Land Reclamation Act and associated rules are being met…." (pg. 53).

Q. DO YOU BELIEVE THAT VISUAL INSPECTIONS CAN ENSURE THAT THE OBLIGATIONS UNDER R647-4 OR UNDER THE UTAH MINED LAND RECLAMATION ACT ARE BEING MET?

A. No. First, visual inspections are limited to surface features. Therefore, there will be no means whatsoever to determine if on-site or off-site environmental degradation to the ground water hydrologic regimes (either quantity or quality) is occurring.

Q. DO YOU BELIEVE VISUAL INSPECTIONS CAN ENSURE THAT THE RELEVENT OBLIGATIONS ARE BEING MET FOR SURFACE WATER AND EROSION?

A. No, because visual inspections alone are not sufficient to determine impacts. It would be necessary to have a rigorous monitoring program of data collection and analyses to determine if the reclamation requirements in R647-4 and 40-8-12 are being met. Specifically, it would be necessary to collect and analyze samples of surface water quantity and quality, and collect and analyze data on erosion and sedimentation occurring on-site and off-site.

Q. ASSUMING THAT DOGM DID IMPLEMENT A DATA COLLECTION AND ANALYSIS PROGRAM, WOULD THAT ENSURE THAT THE RECLAMATION OBJECTIVES IN R647-4 AND 40-8-12 ARE BEING MET?

A. No, because as I discussed above, there are no baseline data on surface water quantity or quality that can be used for comparison to ensure that, among other things, degradation to the surface water hydrologic regime is being minimized or prevented.

Q. DO YOU BELIEVE THAT THE RECLAMATION PLAN DESCRIBED IN THE NOI WILL RETURN THE LAND, WITHIN A REASONABLE AMOUNT OF TIME, TO A STABLE ECOLOGICAL CONDITION COMPATIBLE WITH PAST, PRESENT, AND PROBABLE FUTURE LOCAL LAND USES?

A. No, the stated postmining land use is wildlife habitat and open space. For the reasons discussed above, I believe that there will be impacts to surface water quantity during mining. Although the NOI states that the pits will be externally draining, there are no descriptions or maps showing the final land surface configuration. In addition, there is no analysis of the expected runoff from the reclaimed mine site to indicate the loss of flow to the ephemeral and intermittent streams will not be a permanent impact to surface water. This loss of water will have a negative impact on wildlife and will limit the post mining land use.

Q. DO YOU BELIEVE THAT THERE ARE POTENTIAL IMPACTS TO SURFACE WATER QUALITY THAT WILL INHIBIT THE POSTMINING LAND USE?

A. Yes, I believe that over time, seepage of contaminated water will likely seep through the dumps and in the process would likely be contaminated by the residual chemicals from the processing of the tar sand and may have elevated TDS concentrations. This degradation of the water quality would have a negative impact on wildlife and will limit the post mining land use.

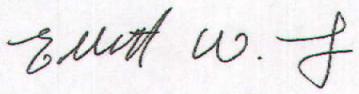
Q. DO YOU BELIEVE THAT THERE ARE POTENTIAL IMPACTS TO GROUND WATER QUANTITY AND QUALITY THAT WILL INHIBIT THE POSTMINING LAND USE?

A. Yes, as I discussed above, the interruption of ground water flow to the seeps and springs from the perched aquifers will likely continue once mining has ceased, and may be permanent. In addition, any flow to ground water that later emerges as seeps and springs could be contaminated by the residual chemicals from the processing of the tar sand and could also have

elevated TDS concentrations. This loss of water and/or degradation of the water quality will have a negative impact on wildlife and will limit the postmining land use.

Q. DOES THIS CONCLUDE YOUR TESTIMONY FOR NOW?

A. Yes.



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